U.S. Department
of Transportation
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Web Services Requirements Document

Federal NOTAM System (FNS)
NOTAM Distribution Service (FNS-NDS)

Web Service Requirements Document

Aeronautical Information Management
Federal NOTAM System
NOTAM Distribution Service (FNS-NDS)

Approval Signatures

Approval Signatures			
Participant	**Name**	**Signature**	**Date Signed**

Revision Record			
Revision Letter	**Description**	**Date**	**Entered By**
Version 0.1	Initial Draft	September 17, 2012	Ming Huang
Version 0.2	Converted to WSRD format	December 24, 2012	Ming Huang
Version 0.6	Internal Review	December 27, 2012	Vinod Vallikat
Version 0.7	Internal Review	January 14, 2013	Jan Bennett
Version 0.8	Internal Review	January 24, 2013	Shaelynn Hales
Version 0.9	Addressed Comments	February 3, 2013	Vinod Vallikat
Version 0.10	Addressed CCB comments	November 14, 2013	Ming Huang/Vinod Vallikat/ Jocelyn Cox
WSRD-FNSNDS-001	Approved under NCP 35058 on 01/29/2014. Updated and submitted final document.	January 29, 2014	
Version 0.11	Updated based on changes to NOTAM policy defined in FAA JO 7930.2N. Added updated extension information.		
A	NCP 35359 approved 10/27/2014. Updated and submitted final document.	October 27, 2014	FNS Team

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1 Scope

This Web Service Requirements Document (WSRD) was prepared in accordance with Federal Aviation Administration (FAA) Standard FAA-STD-070. It provides the requirements for the Federal Notice to Airmen (NOTAM) System-NOTAM Distribution Service (FNS-NDS), the Web Service interface for distributing NOTAMs.

1.1 Background

Accurate, timely distribution of aeronautical information is critical to the safety and efficiency of the National Airspace System (NAS). The Federal NOTAM System (FNS) is a component of the NAS, and a centerpiece of the FAA's Aeronautical Information Management (AIM) Modernization plan. In order to accomplish this modernization, the FAA has reached out to stakeholders from different industries to create a modern digital NOTAM system designed to meet current and future customer needs.

While the current legacy system has a machine interface for distributing NOTAMs, the requirement for FNS-NDS is to build standards based Web Service. Web Service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically Web Service Definition Language (WSDL)). Other systems interact with the Web Service in a manner prescribed by its description using Simple Object Access Protocol (SOAP) messages, typically conveyed using hypertext transfer protocol (HTTP) with an extensible markup language (XML) serialization in conjunction with other Web-related standards. The FNS-NDS should also be harmonized with international efforts in this area, leverage the standards published by Open Geospatial Consortium and also use Aeronautical Information Exchange Model (AIXM) as the main information exchange mechanism.

The purpose of this document is to describe the requirements of the FNS-NDS.

2 Applicable Documents

2.1 Government Documents

The following documents form a part of this WSRD to the extent specified here in.

FAA STANDARDS:	
FAA-STD-063 May 1, 2009	Standard Practice, XML Namespaces
FAA-STD-070 July 12, 2012	Standard Practice, Preparation of Web Service Requirements Documents
FAA-STD-066 February 26, 2010	Standard Practice, Web Service Taxonomies

OTHER FAA PUBLICATIONS:	
7930.2N	Notices to Airmen
NA	Federal NOTAM System General Rules for All Event Scenarios
NA	Federal NOTAM System Airport Operations Event Scenarios
NA	Federal NOTAM System FAA Technical Operations Event Scenarios
NA	Federal NOTAM System Tower Light Outage Event Scenarios
NA	SWIM Governance Policies v1.1 (August 13 2010)
FAA Order 1375.1d	SWIM Service Software Requirements
FAA Order 1370.92A	Password and PIN Management Policy (August 6 2010)

2.2 Non-Government Documents

STANDARDS:

Aeronautical Information Exchange Model 5.1 Specification February 01, 2010	http://www.aixm.aero/public/standard_page/download.html
Digital NOTAM Event Specification	http://www.aixm.aero/public/standard_page/digital_notam_specifications.html
Internet Engineering Task Force (IETF) Request for Comments (RFC) 791 September 1981	Internet Protocol (IP) as updated by RFC 1349
IETF RFC 793 September 1981	Transmission Control Protocol (TCP), updated by RFC 3168
IETF RFC 2246 January 1999	Transport Layer Security (TLS) – version 1.0
IETF RFC 2616 June 1999	Hypertext Transfer Protocol – HTTP/1.1
IETF INTERNET-DRAFT November 18, 1996	The Secure Sockets Layer (SSL) Protocol Version 3.0
IETF RFC 2246 January 1999	Transport Layer Security (TLS) – version 1.0
OGC 09-025r1 and ISO/DIS 19142 November 2, 2010	OpenGIS Web Feature Service 2.0 Interface Standard http://www.opengeospatial.org/standards/wfs
OASIS UDDI v. 3.0.2 October 19, 2004	Universal Description, Discovery, and Integration (UDDI) Standard, version 3.0.2
OASIS WS-Security Core Specification 1.1	https://www.oasis-open.org/committees/download.php/16790/wss-v1.1-spec-os-SOAPMessageSecurity.pdf
W3C SOAP v. 1.2, Pt. 1 Recommendation April 27, 2007	SOAP Version 1.2 Part 1: Messaging Framework (Second Edition)
W3C XML Recommendation September 29, 2006	World Wide Web Consortium Extensible Markup Language (XML) version 1.0, fourth edition.
W3C WSDL v. 2.0 June 26, 2002	World Wide Web Consortium Web Services Description Language (WSDL) version 2.0

3 Definitions and Acronyms

AIM	Aeronautical Information Management
AIXM	Aeronautical Information Exchange Model
DOD	Department of Defense
FAA	Federal Aviation Administration
FDC	Flight Data Center
FES	Filter Encoding Standard
FNS	Federal NOTAM System
FNS-NDS	Federal NOTAM System-NOTAM Distribution Service
HTTP	Hypertext Transport Protocol
HTTPS	Hypertext Transport Protocol Secure
ICAO	International Civil Aviation Organization
MEP	Message Exchange Pattern
MOA	Memorandum of Agreement
NAS	National Airspace System
NOTAM	Notice to Airmen
OGC	Open Geospatial Consortium
QOS	Quality of Service
SLA	Service Level Agreement
SOAP	Simple Object Access Protocol
UTC	Coordinated Universal Time
UUID	Universally unique identifier
WFS	Web Feature Service
WSDL	Web Service Definition Language
WSRD	Web Service Requirements Document
WSDD	Web Service Description Document
XML	Extensible Markup Language

4 Required Service Information

4.1 Service Characteristics

The FNS-NDS is a Web Service interface for querying NOTAMs from FNS. It provides all NOTAMs published in the NAS including the ones originated through FNS and others from the legacy system.

a. The namespace for the service is identified in the Web Service Description Document (WSDD).
b. The name of the service is NOTAM Distribution.
c. The service category for this service is Air Transportation System Service (1.5.3) as defined in FAA_STD-066.
d. The FNS-NDS is designed to meet the Essential category requirements as identified by FAA_STD-066.

4.2 Service Provider

The FNS-NDS will be provided by the Aeronautical Information Management directorate (AIM). AIM is the authoritative source under FAA for collecting, validating, storing, maintaining, and disseminating aeronautical data concerning the United States and its territories to support real-time aviation activities. AIM's XML namespace is us.gov.dot.faa.aim.

4.3 Service Consumers

The FNS-NDS service is available for all NOTAM consumers, which could include but not limited to Department of Defense (DOD), Airlines, third-party developers and other users interested in maintaining a database of the latest NOTAMs issued by the FAA.

5 Functional Requirements

5.1 Service Business Function Requirements

a. FNS-NDS SHALL provide all NOTAMs published in the NAS and available through the current legacy system.

b. FNS-NDS SHALL support query by US domestic location designators (the identifier of the affected facility or location).

c. FNS-NDS SHALL support query by US domestic NOTAM accountability designators (the identifier of the accountability location).

d. FNS-NDS SHALL support query by geographic search using location coordinates in decimal degrees and radius in nautical miles.

e. FNS-NDS SHALL support query where all active NOTAMs are provided at the time of query. FNS-NDS SHALL limit the user to run this query once in 24 hours if it is determined it can cause adverse impact to the system OR to other users of the system. This query SHALL also include a type filter to further improve the efficiency of the response. The types SHALL include FDC, Domestic, International, Military and Local Military.

f. FNS-NDS SHALL support query where all changes to NOTAMs that include new active and cancelled NOTAMs are provided from a given date and time in UTC. For this query, the system SHALL limit queries to be within the past 72 hours.

g. FNS-NDS SHALL limit the user to query no more than once in 5 minutes, except for the condition where all active NOTAMs are provided. In this scenario the system SHALL limit the user to query once in 24 hours.

5.2 Service Interface Requirements

As described above, the FNS-NDS SHALL provide operations/methods to support all the business requirements. It is RECOMMENDED the FNS-NDS interface use relevant names for the operations so they are easily understood. FNS-NDS SHALL use OGC's WFS 2.0 framework to support the query interface. For the GetFeature operation the following query function names are RECOMMENDED. Since the query interface could return more than one NOTAM, it is RECOMMENDED to use FeatureCollection with individual members representing each NOTAM.

- SearchByDesignator for querying by location designators
- SearchByAccountability for querying by NOTAM Accountability
- SearchByLatLong for geographic search
- SearchByLastUpdateDate for incremental search where all changes are provided in the period of time.
- BulkRequest for search that provides all active NOTAMs
- Search By Location and NOTAM Number

- Free Text Search
- If viable use the ResourceID in WFS to support reference identifier search.

5.2.1 Operations

This section provides the requirements for the operations to be provided by the FNS-NDS in accordance with FAA-STD-070.

Table 5-1
SearchByDesignator query operation/function

Operation Name	SearchByDesignator
Description	Query to get all active NOTAMs for a given US domestic location designator.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to query NOTAMs using FNS-NDS.
Input	GetFeature query with SearchByDesignator function.
Output	GetFeature query with SearchByDesignator function.
Effect	Upon success, all active NOTAMs for the given designator SHALL be returned.
Faults	FNS-NDS SHALL respond with errors/exceptions for unsuccessful operation.

Table 5-2
SearchByAccountability query operation/function

Operation Name	SearchByAccountability
Description	Query to get all active NOTAMs for a given US domestic NOTAM Accountability.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to query NOTAMs using FNS-NDS.
Input	GetFeature query with SearchByAccountability function.

Output	GetFeature query with SearchByAccountability function.
Effect	Upon success, all active NOTAMs for the given NOTAM Accountability SHALL be returned.
Faults	FNS-NDS SHALL respond with errors/exceptions for unsuccessful operation.

Table 5-3
SearchByLatLong query operation/function

Operation Name	SearchByLatLong
Description	Query to get all active NOTAMs in a circle defined by location coordinates decimal degrees and a radius in nautical miles.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to query NOTAMs using FNS-NDS.
Input	GetFeature query with SearchByLatLong function.
Output	GetFeature query with SearchByLatLong function.
Effect	Upon success, all active NOTAMs within the circle formed by the coordinates and the radius SHALL be returned.
Faults	FNS-NDS SHALL respond with errors/exceptions for unsuccessful operation.

Table 5-4
SearchByLastUpdateDate query operation/function

Operation Name	SearchByLastUpdateDdate
Description	Query to get all changes to NOTAMs, both newly activated and cancelled from a given date and time in UTC.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to query NOTAMs using FNS-NDS.
Input	GetFeature query with SearchByLastUpdateDdate function.

Output	GetFeature query with SearchByLastUpdateDdate function.
Effect	Upon success all changes including new and cancelled NOTAMs and any updates to existing NOTAMs are provided in the response message.
Faults	FNS-NDS SHALL respond with errors/exceptions for unsuccessful operation.

Table 5-5
BulkRequest query operation/function

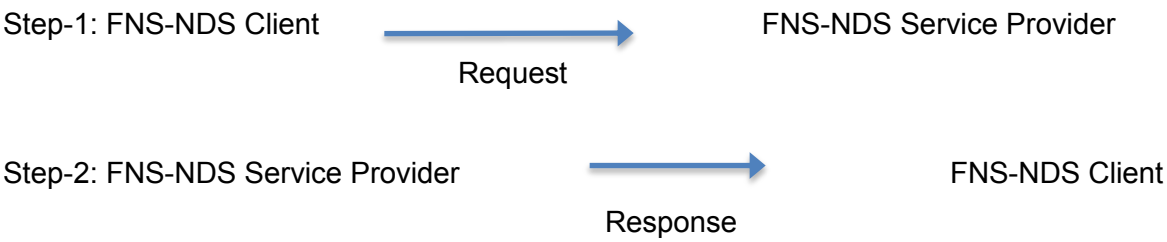
Operation Name	BulkRequest
Description	Query to get all active NOTAMs in the US.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to query NOTAMs using FNS-NDS.
Input	GetFeature query with BulkRequest function.
Output	GetFeature query with BulkRequest function.
Effect	Upon success, all active NOTAMs at the time of request are provided in the response message.
Faults	FNS-NDS SHALL respond with errors/exceptions for unsuccessful operation.

Table 5-6
ResourceID query operation/function

Operation Name	ResourceID
Description	Get the specific NOTAM using the given unique reference/transaction identifier.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to query NOTAMs using FNS-NDS.

Input	GetFeature query with ResourceID function.
Output	GetFeature query with ResourceID function.
Effect	Upon success, the specific NOTAM identified using the given unique reference/transaction identifier is provided in the response message.
Faults	FNS-NDS SHALL respond with errors/exceptions for unsuccessful operation.

All six query operations/functions described above SHALL follow the request/response pattern – meaning, requests have to be initiated by the client of FNS-NDS for getting a response from the FNS-NDS service provider. Since all of the operations follow the same pattern, the generic diagram below is common to all of them.



5.2.2 Messages

FNS-NDS SHALL follow the request/response pattern of service. All requests to FNS-NDS SHALL be initiated by the client and every successful request is provided with a response. FNS-NDS SHALL use the GetFeature interface of OGC's WFS 2.0 framework for query. The various messages to be supported by this service are listed in table 5-7 below.

Table 5-7
Messages supported by FNS-NDS

Name	Definition
SearchByDesignator	Query by US domestic location identifier. Response SHALL include all active NOTAMs for the given identifier.
SearchByAccountability	Query by US NOTAM Accountability. Response SHALL include all active NOTAMs for the given NOTAM accountability.
SearchByLatLong	Geographic search using position (point) coordinates and radius. All Active NOTAMs contained within the circle SHALL be included in the response message.

BulkRequest	Query SHALL return all current active NOTAMs.
SearchByLastUpdateDate	Query SHALL return all NOTAMs (cancelled/active) from a given date. The date SHALL be less than 72 hours from the current time.
ResourceID	Query by FNS Unique Transaction/Reference identifier. Response SHALL include only one NOTAM corresponding to the transaction identifier.

All data elements that SHALL be part of each query operation are discussed in section 5.2.4.

5.2.3 Faults

The FNS-NDS SHALL provide robust handling of errors and exceptions, called Faults in this document. It is RECOMMENDED the service use WFS's ServiceExceptionReport to report errors and exceptions. The ServiceExceptionReport Fault will include detailed message about the cause of the Fault. The Causes of the Fault may include: User_Authorization_Error, User_Input_Data_Error and System_Error.

5.2.4 Data Elements

The minimum set of data elements the FNS-NDS SHALL support are provided in this section. Table 5-8 below provides the data elements required in the request message and Table 5-9 provides the same for the response message. The response message SHALL contain two major parts to them. One part describes the dynamic event using AIXM and the other part contains the generic NOTAM elements. Since the dynamic event would change based on the event scenario, only the elements generic to all responses are provided below. The reader is referred to the FNS NOTAM Scenario documentations listed under Section 2.1 to get the details of the scenario and the content of the AIXM message. Also the FNS-NDS response message SHALL implement the Digital NOTAM Event Specification developed together by FAA and EUROCONTROL.

The namespace of the WSDL is urn:us.gov.dot.faa.aim.fns.nds. This namespace is registered in the FAA Data Registry (FDR). The Internal ID for this namesace in FDR registration is 11821. The namespace of the SOAP body is http://www.opengis.net/wfs/2.0 as specified in WFS specification. WFS also includes Filter Encoding Standard (FES) schema. The namespace for FES is http://www.opengis.net/fes/2.0. The SOAP response is also WFS, which contains AIXM and Event Specication. Please refer to AIXM and Event Specification documents for their namespace, description of permissible values, datatypes and logical diagram of the data elments.

Table 5-8
Data Elements for FNS-NDS Request Message

Name	Definition	Occurrence	Obligation
Username	FNS-NDS user name	1	Required
password	Password	1	Required

fes:ResourceId	ResourceId capability SHALL be used to enter transaction identifier referencing the unique FNS transaction. This SHALL return one single NOTAM identified by the given identifier	1	Required
fes:Function name	Instead of the ResourceId this option SHALL be used to perform a function based query search. The various functions are: - SearchByDesignator - SearchByAccountability - SearchByLatLong - BulkRequest - SearchByLastUpdateDate - SearchByLocationNumber - FreeText	1	Required

Table 5-9
Data Elements for FNS-NDS Response Message

Name	Definition	Occurrence	Obligation
beginPosition	Start date/time of the NOTAM in UTC	At least once	Required
endPosition	End date/time of the NOTAM in UTC	At least once	Required
interpretation	AIXM Temporality model attribute. Possible values: • BASELINE • TEMPDELTA	Follow AIXM rules	Required
Accountability	NOTAM Accountability	1	Required
Location	Affected location	1	Required
Name	Name of Airport	1	Optional
series	NOTAM series value per ICAO Annex-15	1	Optional
number	NOTAM number value per ICAO Annex-15	1	Optional
year	NOTAM year values per ICAO Annex-15	1	Optional
type	NOTAM type value per ICAO Annex-15	1	Optional
issued	NOTAM issue date value per ICAO Annex-15	1	Optional
selectionCode	Q Code value for the NOTAM	1	Optional

location	Location (designator) of the affected facility	1	Optional
effectiveStart	Start date/time of the NOTAM in UTC in YYYYMMDDHH24MI format	1	Optional
effectiveEnd	End date/time of the NOTAM in UTC in YYYYMMDDHH24MI format. If the end date is an estimate, the effectiveEnd will be appended with 'EST'. If the NOTAM is a permanent NOTAM, the value of this element will be 'PERM'.	1	Optional
cancelDate	Cancel date	1	Optional
Schedule	Schedule	1	Optional
text	NOTAM Condition text	1	Optional
type: LOCAL_FORMAT	NOTAM in domestic format	1	Optional
type:OTHER:ICAO	NOTAM in ICAO format	1	Optional
xoveraccountId	Xover Account Id	1	Optional
xovernotamId	Xover Notam Id	1	Optional
lowerLimit	Lower Limit	1	Optional
upperLimit	Upper Limit	1	Optional
originId	Origin Id	1	Optional
snowtamCountryCode	Country Code of SNOWTAM	1	Optional
notamnumber	Legacy NOTAM number	1	Required

5.3 Machine-Processable Service Description Document

It is RECOMMENDED FNS-NDS provide a WSDL describing the Web Service that allows FNS-NDS clients to easily build a client for the service. It is also RECOMMENDED FNS-NDS use Event Specification developed by FAA and EUROCONTROL as the XML schema. If FAA specific requirements are not covered by the FAA/EUROCONTROL Event specification, then extension(s) SHALL be developed.

6 Non-Functional Requirements

6.1 Quality of Service (QOS) Requirements

The FNS-NDS Service SHALL meet the following QOS parameters.

Table 5-14
FNS-NDS Quality of Service Parameters

QoS Parameter	Definition	Method	Unit	Value

QoS Parameter	Definition	Method	Unit	Value
Availability	A measure of the lowest probability that a system or constituent piece will be operational during any randomly selected period of time, or, alternatively, the fraction of the total available operating time that the system or constituent piece is operational.	100 * ((24 – Total Outage Time in Hours) / 24). Measurements are taken daily and apply to the preceding 24 - hour period.	Percentage, accurate to 3 decimal places.	.9975

6.2 Security Requirements

The security requirements of the FNS-NDS are discussed in this section.

6.2.1 Authentication

a. The FNS-NDSSHALL require a user account and password to perform ALL operations supported by the service.

b. The password should meet FAA Order 1370.92A.

c. The user credentials should be included either in the SOAP header or body of the message clearly identified in the WSDD.

6.2.2 Authorization

Only authorized users SHALL be able to use FNS-NDS. Authorized users MUST obtain approval from FNS Program Manager/Chief Engineer.

The FAA reserves the right to terminate access to the FNS-NDS if the user of the service does not comply with the terms of the MOA.

6.2.3 Integrity

This WSRD does not impose any integrity requirements.

6.2.4 Confidentiality

This WSRD does not impose any confidentiality requirements.

6.2.5 Non-Repudiation

This WSRD does not impose any Non-Repudiation requirements.

6.2.6 Audit Capability

This WSRD does not impose any Audit capability requirements.

6.2.7 Other Security Requirements

This WSRD does not impose any other security requirements.

7 Implementation Requirements

7.1 Binding Requirements

7.1.1 FNS NOTAM Distribution Service

FNS NOTAM Distribution Service has only one SOAP binding. The name of the binding is wfs-SOAP as specified in the WSDL. There is one Interface associated with wf-SOAP binding. The name of the interface is NDSDistribution.

7.1.1.1 Data Protocol

All operations provided by the FNS-NDS SHALL use AIXM 5.1 as the payload of the message and follow the Event Specification described in earlier sections. Complete details on AIXM can be found on the AIXM web site http://www.aixm.aero. Since FNS uses scenarios/event specifications to describe digital NOTAMs, the General Rules, Airport Operations, Technical Operations, and Tower Light Outage event scenario documents listed under Other FAA Publications of Section 2.1 SHALL be used.

7.1.1.2 Message Protocol

The Web Services provided by FNS-NDS SHALL be SOAP 1.1 compliant.

7.1.1.3 Transport Protocol

FNS-NDS SHALL use HTTPS as the communications protocol.

7.1.1.4 Other Protocols

This WSRD does not impose any other protocol requirements.

7.2 Processing Requirements

This WSRD does not impose any other processing requirements.

7.3 Operational Environment Requirements

a. The FNS-NDS should be deployable on a Sun Solaris Operating System. The Service should also be functional on both Glassfish and IBM Websphere application server environments.

b. This WSRD does not impose any network compliance requirements.

c. This WSRD does not impose any configuration requirements.

d. Other than the items listed in this section, this WSRD does not impose any other operational environment requirements.

8 Quality Assurance Provisions

8.1 Responsibility for Verification

The FAA is responsible for developing and implementing the verification of requirements for each project. The FAA may delegate verification activities to other organizations, independent contractors, and/or the prime contractor.

8.2 Special Verification Requirements

Other than having an independent test environment for testing the FNS-NDS, no other special verification requirements are imposed on this service.

8.3 Verification Requirements Traceability Matrix

Verification shall be in accordance with Table 8-1,Verification Requirements Traceability Matrix (VRTM)

Table 8-1,Verification Requirements Traceability Matrix

A = Analysis; D = Demonstration; I = Inspection; T = Test; X = Not Applicable

Section Number	Requirement Title	Requirement ID	Verification Level	
			Service Level	Integration Level
5.1	Service Business Functions			
		a	A, D	A, D
		b	A, D	A, D
		c	A, D	A, D
		d	A, D	A, D
		e	A, D	A, D
		f	A, D	A, D
		g	A, D	A, D
5.2	Service Interfaces			

		SearchByDesignator for querying by location designators	D, I	D, I
		SearchByAccountability for querying by NOTAM Accountability	D, I	D, I
		SearchByLatLong for geographic search	D, I	D, I
		SearchByLastUpdateDate for incremental search where all changes are provided in the period of time	D, I	D, I
		BulkRequest for search that provides all active NOTAMs	D, I	D, I
		If viable use the ResourceID in WFS to support reference identifier search	D, I	D, I
		SearchByLocationNOTAMNumber for querying specific NOTAM by location and assigned NOTAM number	D, I	D, I
		FreeTextSearch for querying by text string in the NOTAM text	D, I	D, I
5.2.1	Operations			
		SearchByDesignator	I	I
		SearchByAccountability	I	I
		SearchByLatLong	I	I
		SearchByLastUpdateDate	I	I
		BulkRequest	I	I
		ResourceID	I	I
		SearchByLocationNOTAMNumber	*I*	*I*
		FreeTextSearch	*I*	*I*
5.2.2	Message			
		SearchByDesignator	T	T
		SearchByAccountability	T	T
		SearchByLatLong	T	T
		SearchByLastUpdateDate	T	T
		BulkRequest	T	T

		ResourceID	T	T
		SearchByLocationNOTAMNumber	T	T
		FreeTextSearch	T	T
5.2.3	Faults		I, T	I, T
5.2.4	Data Elements			
		SearchByDesignator	I, T	I, T
		SearchByAccountability	I, T	I, T
		SearchByLatLong	I, T	I, T
		SearchByLastUpdateDate	I, T	I, T
		BulkRequest	I, T	I, T
		ResourceID	I, T	I, T
		SearchByLocationNOTAMNumber	I, T	I, T
		FreeTextSearch	I, T	I, T
6.1	Availability		I, T	I, T
6.2	Security			
6.2.1		Authentication	I, T	I, T
6.2.2		Authorization	I, T	I, T
7.1	Binding			
7.1.1.1		Data Protocol	A	A
7.1.1.2		Message Protocol	A	A
7.1.1.3		Transport Protocol	A	A
7.2	Processing		I, T	I, T
7.3	Operational Environment		I, T	I, T